History of Weather Observing at Fort Marcy, New Mexico 1849 - 1892

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Executive Summary

United States Army surgeons began taking weather observations in the Fort Marcy/Santa Fe, New Mexico area on January 1, 1849. Although Fort Marcy was "technically" located on a mesa approximately 600 yards northeast of the Santa Fe Plaza, the Army hospital, and location of the weather observations, was located approximately 300 yards northwest of the Plaza within the city of Santa Fe. The surgeons took the primary weather observations from 1849 until late 1871 when the U.S. Signal Service assumed weather observing responsibility. The longest gap of missing observations at Fort Marcy is from Mar 1, 1862 to Sep 8, 1862, generally corresponding to the time Santa Fe and Fort Marcy were occupied by Confederate troops (Mar 4 – Apr 7, 1862). Evidence indicates the surgeons continued to take weather observations after the Signal Service assumed responsibility - until February 29, 1892 - although availability of these records is limited. Unfortunately, no direct information could be found regarding type, or exposure of weather instruments used by the Fort Marcy surgeons. The most extensive information on weather observations at Fort Marcy is located in the National Climate Data Center, with the best sources of information on weather instruments in publications by the Army Surgeon General's Office in 1844, 1850, 1851, 1856, and 1868.

Fort Marcy Historical Overview

Weather observations at Fort Marcy were taken by United States Army surgeons from 1849 into the1890s (based on data at the National Climate Data Center). This requirement of observing the weather by Army surgeons was mandated in 1814 by Dr. James Tilton, Surgeon General of the Army. Although the project grew slowly during the early 19th Century, by 1853 weather observations were being taken at 97 Army camps, including Fort Marcy.

In August1846, the United States Army marched into Santa Fe, NM and accepted the peaceful surrender of New Mexico from Acting Governor Juan Bautista Vigil y Alarid. The following day, Brigadier-General Stephen Watts Kearny ordered Lieutenants William H. Emory and Jeremy F. Gilmer to survey the Santa Fe area for a location suitable for the construction of a fort. A site on a 100-foot mesa approximately 600 yards northeast of the Santa Fe Plaza was selected. The name selected for the new adobe fort was to be in honor of Secretary of War William L. Marcy. Fort Marcy was the first U.S. military post constructed in the present states of New Mexico and Arizona. It represented a fortification from which the Americans could protect against local insurrection or defend the city should a Mexican army advance up the Rio Grande to challenge the U.S. presence. It was finished in the spring of 1847.

Fort Marcy was an irregular hexagonal polygon, with adobe walls nine feet high and five feet thick. It contained a powder magazine and an adobe blockhouse. A limited soldier barracks and extensive defensive works also were constructed on the mesa. Fort Marcy was never called upon to defend Santa Fe, and as a result, in 1848 military quarters were established just north of the Santa Fe Plaza, or approximately 600 yards southwest of the mesa fort. These quarters housed most of the officers and soldiers of the fort and existed

until 1894. These facilities also were referred to as the "Santa Fe Post." Figure 1 shows the location of the Fort Marcy Army Hospital with respect to the Fort Marcy quarters at Santa Fe (circa 1876). The army hospital and officer quarters were located approximately 300 yards northwest of the Santa Fe Plaza.

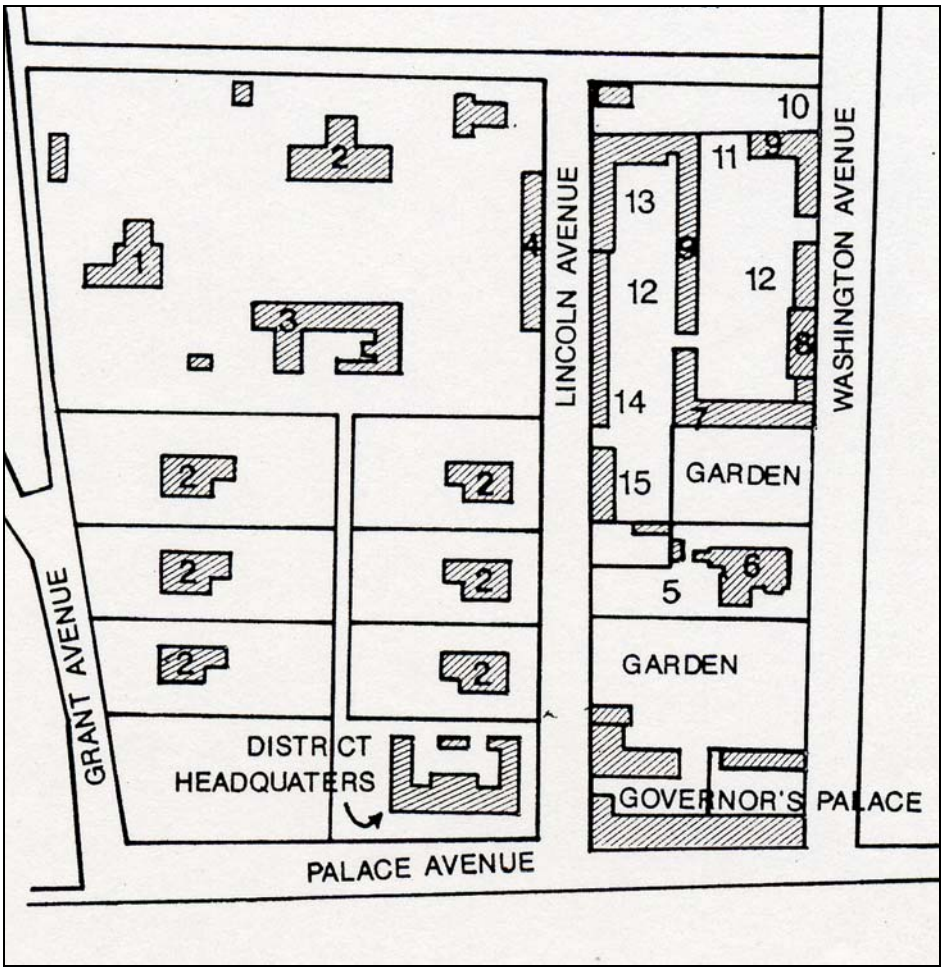

Figure 1. Map of Fort Marcy (around 1876) showing location of Army hospital (building number 1) and officers' quarters (building number 2) with respect to the Santa Fe Plaza. Other related army building identifications include Company Quarters (building 3) and Command Officers Quarters (building 6). The Santa Fe Plaza was located just south of Palace Avenue between Lincoln and Washington Avenues. Distance from the Army hospital to Palace Avenue is approximately 250 yards. North is at the top of the page. From the New Mexico State Records Center and Archives.

Fort Marcy saw limited action during the American Civil War. In the summer of 1861, Confederate troops out of Texas invaded New Mexico. As the Confederate forces approached Santa Fe on March 4, 1862, the New Mexican territorial government moved from the capital to Las Vegas, NM. In addition, Federal troops at Fort Marcy relocated to

Fort Union (located near Las Vegas). Within a few weeks (April 7, 1862), the Confederates were driven from Santa Fe and Fort Marcy reoccupied.

On August 28, 1868, the old fort on the mesa was abandoned upon instructions from an Executive Order from President Andrew Johnson, leaving the Fort Marcy quarters located just north of Santa Fe Plaza, including the army hospital. On October 10, 1894, the U.S. Army abandoned all Fort Marcy facilities in Santa Fe.

Below are important national dates that relate to weather observing history at Fort Marcy.

May 2, 1814 – Army Surgeon General orders field surgeons to keep routine weather diaries.

August l0, 1846 - General Stephen Kearny's forces arrived in Santa Fe to proclaim New Mexico a part of the U.S. Fort Marcy was established on a mesa one-half mile east of the center of the town of Santa Fe.

January 1, 1849 – Army surgeons at Fort Marcy began keeping daily weather diaries.

March 4 – April 7, 1862 – Fort Marcy and Santa Fe occupied by Confederate troops.

November 18, 1871 – The Army Signal Service's new Division of Telegrams and Reports for the Benefit of Commerce begins operations just east of the Santa Fe Plaza. Army surgeons continued to take routine weather observations until July 1873, with intermittent observations available in the National Climate Data Center (NCDC) database until February 1892.

July 1, 1891 – The U.S. Army Signal Service transfers civilian meteorological services to the Weather Bureau.

October 10, 1894 – The Army closes Fort Marcy.

Location Descriptions

Limited information was located that indicated the exact locations where army surgeons took weather observations at Fort Marcy. Although latitude, longitude, and elevations for the observing sites were included on the observing forms, these data have shown to be unreliable and inaccurate. Instructions from the Army Surgeon General provided no clarification on possible locations. Appendix J of the duties of members of the medical Department (U.S. Army) in 1814 state the Senior Hospital Surgeon will keep diary of weather, medical topography of country where he is serving. Considering this statement and the locations of Army buildings at the two sites for Fort Marcy and Santa Fe (on the mesa and near the Plaza), it is most likely that the surgeons took their weather observations very near the post hospital located just northwest of the Plaza (see Figure 2). This also is supported by brief comments on the observation forms in Oct and Nov 1867.

Figure 2. Location of U.S. Army Hospital at Fort Marcy with respect to the Santa Fe Plaza. Both locations are plotted on a current map of Santa Fe. North is the top of the page. Distance from the hospital to Plaza is approximately 300 yards

Due to the close proximity of Santa Fe to Fort Marcy and to fully understand the history of weather observing in the Santa Fe area, it is essential to comprehend the evolution of weather observing at Santa Fe (i.e., Signal Service and Weather Bureau) since the two are intertwined (Fort Marcy surgeons also took weather observations into the very early Weather Bureau period). Although weather observing history for Santa Fe is documented in a separate report, proximity and natural functional linkages between the two sites require cross references between the two documents. The first Signal Service observation site in 1871 was approximately 325 yards southeast of the Army Hospital (Figure 3) with the remaining Signal Service and subsequently most Weather Bureau observations taken in the vicinity of the Santa Fe Plaza.

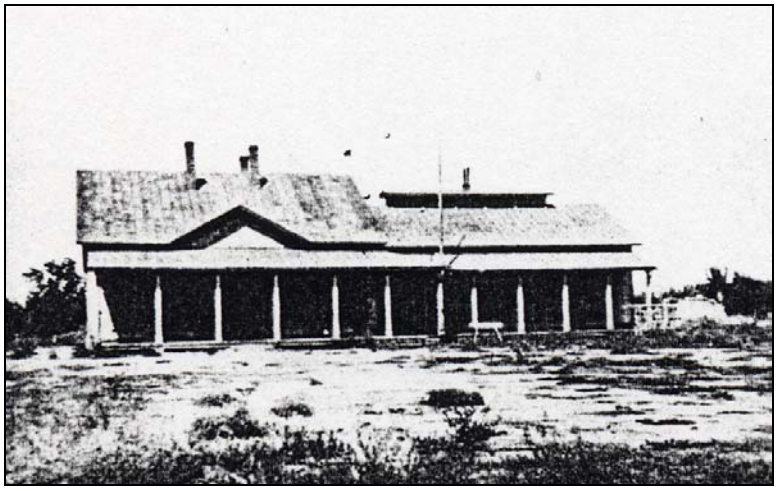

Figure 3. Old Fort Marcy hospital building (ca 1905; at the time a school building). The building was demolished in August 1954. View appears to be looking north. From the New Mexico State Records Center and Archives.

Based on available weather data for the area, primarily from NCDC, weather observations by Army surgeons at Fort Marcy began on Jan 1, 1849. The first observations were recorded on blank forms (i.e., no printed headings) requiring observers to hand write dates (down the side of the page) and weather phenomena observed (across the top of the page). These first observation forms were called "Diary of the Weather" and conformed to the title of the observations required by the 1814 instructions, i.e., "…will keep diary of weather." Beginning in Sep 1849, pre-printed forms (heading, dates, and weather to be observed) were used that were labeled, "Form No. 3, Meteorological Register."

Although latitude/longitude for the early weather stations frequently were unreliable, the consistency of reported coordinates is one means (the other being elevation for this high terrain location) of determining possible movement of observation locations. The following are GPS derived coordinates and elevations for the Fort Marcy hospital, as well as the Fort Marcy mesa location:

Fort Macy hospital - 35°41'35.28"N 105°56'11.83"W; 7035 feet (accuracy of 18 feet)

Fort Marcy mesa - 35°41'36.28"N 105°55'39.72"W; 7150 feet (accuracy of 18 feet)

The first mention of coordinates with regard to Fort Marcy was Jan 1850 when the following coordinates were listed on the observation forms, 35°41'6"N 106°2'36"W. In Jul 1850 the first mention of elevation was 7,500 feet (actual wording was "Altitude of Bar. Above Atlantic Ocean 7,500 ft"). Changes in elevation were not uncommon with

the early Fort Marcy observations, e.g., on the Dec 1850 form the elevation was listed as 6,000 feet.

A few missing observations occurred in the NCDC records from Jan 1849 to Jul 1851, but no observations existed from Jul 1851 to Sep 1852. When the observations resumed in Sep 1852, station coordinates changed from 35°41'6"N 106°2'36"W to 35°41'6"N 106°1'23"W and the elevation changed from 6,000 feet to 6846 feet. These latter coordinates and elevation were on most observation forms through the 1850s, 1860s, and early 1870s..

Considering that none of the above coordinates/elevation correspond to GPS values, it is likely the variance can be explained by measuring error or inaccuracies. The possibility exists that very early observations, i.e., 1849 through 1852, may have been taken at the Fort Marcy mesa as the Plaza quarters were being constructed, although no evidence exists that any medical facilities were ever located on the mesa. Based on consistency of the coordinates/elevation following Sep 1852 and the availability of the Plaza quarters, subsequent observations likely were taken at (or near) the Fort Marcy hospital, even though the coordinates/elevation reported on the weather observing forms are not in agreement with actual values for this location. The location defined by the coordinates on the observing forms would have placed the site in the desert several miles west of Santa Fe Plaza and even farther from the Fort Marcy mesa.

Concrete supporting information was contained on the Oct and Nov 1867 forms which identify the observation site as the hospital and contains the coordinates and elevation used on most of the forms beginning in Sep 1852 (35°41'6"N 106°1'23"W, elevation 6846 feet).

A gap in observations exist in the NCDC records from Mar 1, 1862 to Sep 8, 1862, generally corresponding to the time Santa Fe and Fort Marcy were occupied by Confederate troops (Mar 4 – Apr 7, 1862). The coordinates listed on the Sep 1862 observations are 35°41'N 106°10'W, elevation 8553 feet. On the Oct 1862 form the coordinates returned to 35°41'6"N 106°1'23"W, elevation 6846 feet, i.e., taken at the Army hospital just northwest of Santa Fe Plaza. It is possible the Sep 1862 observations were taken at a location other than the hospital, although the coordinates indicate a position farther west in the desert with the reported elevation not consistent with area terrain.

The U.S. Signal Service began taking official weather observations on Nov 18, 1871, and the Weather Bureau began observations on Jul 1, 1891. See the Santa Fe report for more specific information regarding subsequent observations beginning in 1872.

NCDC records indicate that Army surgeons at Fort Marcy continued to take weather observations, at least intermittently, into the early 1890s. A note on the bottom of the Feb 1891 Meteorological Register states: "Meteorological instruments taken down and packed for shipment to Fort Wingate, NM. Fort Marcy ordered to be abandoned." However, additional observations are available for Jan 1892 and Feb 1892. The last

monthly form (Feb 1892) contains a title for the observer as: "In charge of hospital," indicating the weather observations continued to be taken at, or near the Fort Marcy hospital until discontinued.

Instrumentation Descriptions

Specific information regarding number, type, location, and exposure of weather instruments at For Marcy/Santa Fe for either the Army (surgeon observations) or Signal Service was not available. However, general inferences can be made from the monthly weather summaries, as well as from documented instructions from appropriate headquarters.

Rain Gage

The following are instructions and information taken from a book published in 1851 entitled, *Meteorological Register: Observations Made by the Officers of the Medical Department of the Army at the Military Posts of the United States*:

> "In 1836, rain gauges were furnished to many of the posts, by which the daily falls of rain and snow could be measured and entered upon the tables in inches and the fractions of an inch. The instrument employed is the conical rain gauge of De Witt; and observations are ordered to be made immediately after every shower or fall of rain or snow. The following are the instructions issued by the Department for its observers:
>
> 'The instrument used to measure the quantity of rain which falls, is the conical rain gauge. It will be kept remote from all elevated structures at a distance at least equal to their height, and still further off, where it can be conveniently done. It is to be suspended in a circular opening, made in a board, which is to be fixed to a post, eight feet from the ground; the opening to be five inches in diameter, and beveled, so as to fit the side of the gauge, into which the cap is to be fixed, base downwards, to prevent evaporation.
>
> 'In freezing weather, when the rain gauge cannot be used out of doors, it will be taken into the room, and a tin vessel will be substituted for receiving the snow, rain, or sleet that may then fall. This vessel must have its opening exactly equal to that of the rain gauge, and widen downwards to a sufficient depth, with a considerable slope. It should be placed where nothing can obstruct the descending snow from entering, and where no drift snow can be blown into it. During a continued snow storm, the snow may be occasionally pressed down. The contents of the vessel must be melted by placing it near the fire, with a cover to prevent evaporation, and the water produced poured into the gauge to ascertain its quantity, which must then be entered into the Register."

These instructions with respect to the rain gage remained in effect until the summer of 1868. On Aug 10, 1868, the Army Surgeon General's Office issued the following with regard to the rain gage:

> "The rain gauge now issued by the Department is a brass cylinder seven and a half inches high, and with a diameter at its mouth of one and ninety-seven hundredths (1.97) of an inch; this diameter being fixed upon for the reason that one inch of rain falling through such an aperture will measure exactly fifty cubic centimeters (50 cc), and centimeter graduates are furnished with each gauge for the purpose of making such measurement.'
>
> 'The most desirable place for a rain gauge, other things being equal, is at the surface of the ground, but since it is not easy to protect an instrument in that situation, the gauge will be placed on the top of a post eight feet high,…'
>
> 'For measuring very heavy snow falls, a snow gauge must be used having a mouth of the same size with that of the rain-gauge, but wider at the bottom, so as not to be easily overfilled. The snow which falls in it is to be melted and measured in the centimeter graduate."

Thermometer (Exposed and Wet Bulb)

Based on available information, Army field surgeons were given considerable flexibility in locating station's detached (or exposed) thermometer. According to instructions from the Army Surgeon General in 1844:

> "The Thermometer will be placed in a situation having a free circulation of air, not exposed to the direct or reflected rays of the sun, and sheltered from rain. Its situation should be remote from massy walls, which slowly imbibe or part with caloric. In making observations avoid breathing on the instrument, or touching it; and at night manage your lamp so as not to cause a rise of the mercury by its heat."
>
> NOTE – No changes occurred in the Army Surgeon General instructions with regard to the thermometer from 1844 through 1856.

On Aug 10, 1868, the following instructions were issued to Army field surgeons by the Surgeon General's Office regarding thermometer placement:

> "The thermometer should be placed in the open air, but under a roof of some kind, and should be well sheltered toward the South. It should be protected not only from the direct rays of the sun, but from the influences of all surfaces which strongly reflect the sun's heat, and of all bodies, such as thick walls, large rocks, etc., which become great reservoirs of heat during the day, and of cold during the night.'

'…The height which it is deemed best to fix upon is that of four feet from the ground to the thermometer bulb, and the surface under the thermometer should be of short grass, sufficiently exposed to the sun and wind to keep it from habitual dampness.'

'A thermometer box, in which most of the thermometers observed and recorded at the station are suspended, is generally used for the best conducted meteorological observations, and one should be made and set up at every post where there are means of constructing it. This box, which should be at least two feet square, is preferably made of louver-boards or overlapping slates, but ordinary boards pierced with numerous half inch holes may be used instead. It should be open at the bottom, and have a roof which will shed rain. One of the sides should be hinged for convenience of access to the interior, or the box may be left permanently open toward the North, a piece of board or of canvas being used to protect it against driving winds from that quarter. This box is to be well secured on posts, at the proper height from the ground. It should be sheltered from the sun between sunrise and 7 AM, and between 11 AM and 3 PM, special screens being erected for the purpose if necessary. These screens, as well as the box itself, should be whitewashed or painted white."

The Surgeon General's instructions in 1868 are the first mention of maximum and minimum thermometers. It was not apparent whether maximum and minimum thermometers were provided to the Army surgeons at Fort Marcy:

"Maxim and minimum registering thermometers will be supplied to certain posts for the purpose of enabling the greatest cold of the night and the greatest heat of the day to be recorded. They are to be hung in a horizontal position, and observed once a day, preferably in the morning, when they will give the minimum of the preceding night and the maximum of the preceding day. After the readings have been taken the instruments are to be set and not disturbed until the same time the next day.'

'The maximum thermometer is of the same plan as the maximum clinical thermometer furnished to Medical Officers, and special instructions will be sent with it when issued.'

'The minimum is a spirit thermometer, in the bore of which a double-headed rod of black enamel floats. This rod or index is drawn back when the alcohol recedes, by reason of the resistance of the surface of the liquid to rupture or change of form, and thus reaches the lowest point to which the thermometer falls…"

The 1844 instructions state the following with regard to obtaining the wet bulb temperature:

> "The most easy method of finding this (wet bulb temperature) is to wet the bulb of a Thermometer covered round with fine gauze, and swing the instrument in the open air, in the shade, until the mercury sinks as low as it will."
>
> "The current of air upon the wet-bulb should be kept up (by swinging) as long as the mercury continues to descend in the tube of the instrument, and for a few minutes after it becomes stationary, in order to ensure the full effect of the evaporation and the lowest degree to which the mercury can be forced to descend by this process, will constitute the observation required…"

NOTE – No mention is made of the hygrometer or wet-bulb temperature in the 1850 instructions from the Surgeon General since the wet bulb ceased to be measured around that time. Wet-bulb temperatures began to be measured again in the Army Medical Department in 1856 and the 1856 instructions contained the following:

> "The hygrometer adopted by this Department consists essentially of a thermometer, the bulb of which is covered with floss silk enclosed in a piece of thin muslin, the ends of the silk sufficiently long to dip into water contained in a brass reservoir secured immediately below the bulb. In the top of this reservoir is a small opening to admit the silk, and to the front is attached a cylinder communicating with the interior by a small hole. The reservoir is to be kept always supplied with water poured into it through the cylinder, and the bulb will be constantly moistened by capillary absorption."

The 1868 instructions elaborated on taking wet-bulb temperatures:

> "An apparatus for swinging a pair of thermometers – a wet and dry bulb – has been constructed at this Office, and will be issued to a certain number of posts for making specially accurate observations. In using this apparatus the covering of the wet bulb is to be moistened with a soft brush before each observation, and the apparatus then whirled round for a few minutes…'
>
> 'When a stationary wet bulb is used it is to be placed in the box with the other thermometers, but far enough from them not to communicate cold to their bulbs. All casings around the lower part of such a thermometer should be removed, and a piece of wick which dips by one end into a receptacle of rain water, should have its other end coiled around the stem and resting on the top of the bulb, in such a way as to keep the muslin covering uniformly and sufficiently wet. If the wick is connected with the lower part of the bulb, the wetting is more apt to be unequal."

Barometer

With regard to the barometer, the 1844 instructions from the Army Surgeon General indicated the following:

> "The instrument adopted by the Department is the siphon Barometer of Bunten. …The Barometer will be suspended perpendicularly in a good light, in an apartment having an equable temperature, and a dry atmosphere."
>
> "When once suitably placed, the position of the instrument should not be changed, unless from absolute necessity – in which case the circumstances will be carefully noted on the Register, under the head of 'Remarks."

NOTE – Instructions in 1856 stated, "The barometer now in use by the Department are the siphon, of Bunten, and the cistern, of Green." No other changes are documented with respect to the barometer from instructions in 1844 through the instructions in 1856.

Instructions issued by the Surgeon General's Office on Jul 1, 1868 stated that two forms of barometers were in use at Army field stations-a cistern barometer for low altitudes (below 2,000 feet) and one for high altitudes (which applied to Fort Marcy). The primary difference between the two barometers was that when taking an observation using the high-altitude barometer, the observer had to adjust the level of the mercury in the cistern (by means of an adjustment screw) until the mercury touched the ivory point. This was not required for the low altitude barometer.

Wind Instruments

Available documents suggest that no wind instruments were available to Army field surgeons prior to the 1860s. Instructions from the Surgeon General's Office in 1844, 1850, and 1856 provided guidelines for subjective observations. Wind directions were to be expressed by the points of a compass, as done by observing the general direction from which the wind was blowing, and wind force was to be express by a subjective scale ranging from 0 to 10 (e.g., "A gentle breeze" for a scale value of "2," "A brisk breeze" for a scale value of "4," and a scale of "6" for "A very strong wind"). These guidelines appeared to have remained in effect until around the 1860s.

Instructions from the Surgeon General's Office issued on Aug 10, 1868, provided the following descriptions:

> "The direction of the wind is to be determined in the usual way by a vane or weathercock placed as far above the ground as practicable and at a distance from all buildings, trees, etc., higher than itself. The staff of the wind vane should have attached to it bars indicating the direction of each of the four points of the compass.'

'Anemometers, or instruments for measuring the velocity of the wind, with instructions for their use, will be issued by the Department to those posts where observations on the winds are of the most importance.'

'Where special instruments are not furnished for the purpose, the velocity of the wind may be estimated by observing the horizontal motion of light bodies – as clouds of smoke, the pollen of plants, handkerchiefs thrown in the air, etc., when blown before the wind. A motion of one yard per second may be estimated as equal to two miles per hour.'

'If means can be found for estimating the pressure on a surface of known size, as on a piece of board held perpendicularly to the direction of the wind, or an open umbrella with its concave surface toward the wind, the velocity may be calculated from it. The square root of two hundred times the pressure expressed in pounds per square foot, will give the velocity expressed in miles per hour."

The wind scale in the 1868 instructions changed to reflect quantitative values, e.g., a scale value of "2" represented a wind speed between 5 and 10 mile per hour, a scale value of "4" represented a wind speed between 15 and 20 miles per hour, and a scale value of "8" represented winds between 50 and 60 miles per hour.

Special Observations

The following was listed in the Army Surgeon General instructions in 1844 with regard to taking special hourly weather observations during equinoxes and solstices:

"Hourly Observations of the Barometer will be taken for 24 hours, at the equinoxes and solstices, to correspond with those already instituted at numerous points of Europe and America, at the suggestion of Sir John Herschel. The days fixed upon for these observations are the 21st of March, June, September, and December. But should any one of these 21st days fall on Sunday, then the observations will be deferred till the next day, the 22nd."

"The observations at each station will commence at 6 o'clock, A.M. of the appointed days, and be continued at the beginning of each hour till 6 A.M. of the following days, care being taken to obtain the correct time."

"The exact maximum and minimum of temperature of the 24 hours should be recorded, under the head of 'Remarks,' at the precise hour and minute at which they occur."

"The value of these hourly observations will be greatly enhanced, if they be extended to all the objects embraced in the daily Register. If there be a storm about those times, hourly observations of all the phenomena, from the beginning to the end of the storm, will also be valuable."

"All special observations will be recorded separately."

"Connected with meteorology are many interesting subjects of inquiry, which can only be elucidated by wide-spread, simultaneous observations. The Medical Officers of the Army are therefore confidently invited to co-operate in the collection of data tending to advance the interests of science. For the accuracy of our observations, (quoted as they will be both at home and abroad,) it is hardly necessary to say, the reputation of the Department is pledged."

NOTE – The instructions in 1850 contained the same information as depicted in 1844. However, no mention was made of special hourly observations in the 1856 instructions nor in the 1868 instructions, indicating this requirement was dropped.

Routine Weather Observations

Weather observations in the NCDC database for Fort Marcy are contained under both the names "Fort Marcy" and "Santa Fe." Observations from 1849 through Jul 1856 are stored under "Santa Fe," with the observations beginning Aug 1856 through Sep 1867 stored under "Fort Marcy." Observations beginning Oct 1867 are stored under "Santa Fe," and remain under this title through the Signal Service years (into 1892). Observations stored under Fort Marcy begin in 1890 (taken by Army surgeons) and continue into 1892.

The first observations available in the NCDC database are for Jan 1849. The first measured parameters (versus observed conditions, e.g., clouds and weather) available from the Army surgeons at Fort Marcy in Jan 1849 consisted of temperature. Observed parameters were wind direction and force, state of the weather plus a remarks section. By Sep 1849, rainfall was added and wet bulb temperatures were included beginning Oct 1, 1849 but stopped Mar 20, 1850.

Beginning Sep 1, 1849, the Army surgeons (actually, weather observations frequently were taken by Assistant Surgeons) at Fort Marcy began taking observations following instructions for a new form, Form No. 3, Meteorological Register, that would continue in use through Jul 1855. Observations measured to be included on this form included: 1) Thermometer Detached; 2) Wind (direction and force scale); and 3) Rainfall (beginning/end and amount). Observed parameters included: 1) Clearness of the Sky (a "10" for clear skies ranging to a "0" for cloudy skies; 2) Clouds (direction and speed of movement); and 3) Remarks. Also listed on the form, but not observed initially at Fort Marcy were: 1) Barometer; 2) Thermometer Attached; and 3) Wet Bulb (although this parameter was measured for a short time in 1849 and 1850). In late 1851 or early 1852 (specific date unavailable due to missing records) the Wet Bulb column was dropped from the printed Army weather observation form used at Fort Marcy, reflecting a de-emphasis of this parameter. Comments on the forms indicate the terms "thermometer detached" and "thermometer attached" applied to thermometers attached and not attached to the mercurial barometer.

On Aug 1, 1855, a new Meteorological Register form was used at Fort Marcy. The following continued to be measured: 1) Temperature; 2) Wind (direction and speed scale); and rainfall (beginning/ending and amount). Observed phenomena were Weather (sky conditions were included in the weather column) and Remarks. The Barometer column was dropped and a Hygrometer column added (although this column was not initially measured at Fort Marcy). Hygrometer measurements were started on Aug 14, 1856. This form continued in use until Sep 1, 1871.

On Sep 1, 1871, a new weather observing form was used at Fort Marcy that included: 1) Temperature; 2) Self-Registering Thermometer (not used); 3) Movements of Atmosphere; 4) Amount of Cloudiness; 5) Rain and snow melted (beginning/ending and amount); and 6) Remarks. Sporadic records indicate wet bulb readings likely continued to be taken but logged on separate forms.

On Nov 18, 1871, the U.S. Signal Service began taking weather observations in Santa Fe. The timeline, as well as location and exposure of instruments are contained in the Santa Fe report. NCDC records suggest the intermittent type of observations taken into the 1870s by Army surgeons at Fort Marcy were identical to those before the Signal Service assumed responsibility. However, the last records for observations taken by the Army surgeons-early 1890s-indicate only parameters reported were temperature, precipitation (beginning/end, amount, and depth of snowfall), and general direction of the wind. Last recorded observation for Fort Marcy in the NCDC database was for Feb 29, 1892. Since the Army had a presence at Fort Marcy for almost an additional three years, additional weather observations from the Army surgeons may have been possible until the fort closed on Oct 10, 1894.

Acknowledgments

Steve Doty developed the procedures and methodologies used in developing this report. Without the extensive work of Steve in developing the appropriate process, this research would not have been possible.

The staffs at the Angelico Chavez History Library and the New Mexico State Records Center and Archives were very helpful in locating old maps, photographs, and textual information on the Fort Marcy area. Their help is greatly appreciated.

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Data Sources

Data regarding instruments and specific locations for this period of weather observing, i.e., by the Army surgeons, is sparse to non-existent. The NCDC database contains almost continuous weather observations by the surgeons at Fort Marcy from 1849 through 1871, but no information was available on instrument location, exposure, or type of instruments used. In addition, the surgeons themselves appeared to take meticulous weather observations, but did not include any information on the forms with respect to the instruments.

Primary information regarding weather instruments used by the Army surgeons and procedures used to take the observations came from publications by the Army Surgeon General (in 1844, 1850, 1851, 1856, and 1868) which provided instructions to be followed by field surgeons.

Annual reports by the U.S. Army Surgeon General were reviewed for the years 1825 through 1875 with only bits and pieces of information revealed. The primary exception was the annual report for 1844 which contained a summary of instructions for taking weather observations; however, a more detailed document was obtained from the National Library of Medicine in Bethesda, MD. Several publications by the Army Surgeon General were obtained from the extensive government library microfiche collection at Oklahoma State University.

The Angelico Chavez History Library and the New Mexico State Records Center and Archives contained quality general information regarding Fort Marcy but contained little, no specific material on the hospital or Army surgeons. Newspaper archives exist back into this period, but contained no relevant information.

Other possible sources of information checked included the Santa Fe Public Library, National Park Service Archives at Fort Union, NM, National Park Service Library at Santa Fe, New Mexico Highlands University Library/Archives (Las Vegas, NM), New Mexico State Library, State Engineer's Library, and the State of New Mexico Historical Preservation Division.